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ECOLOGICAL SCIENCES—AGRONOMY TECHNICAL NOTE

Waste Utilization/Nutrient Management

Microsoft Excel Spreadsheet*

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The following provides background and instructions to use the automated Waste Utilization and Nutrient Management worksheets. The Microsoft Excel Spreadsheet provides an efficient means of calculating nutrient concentrations in agricultural wastes and designing nutrient budgets. To complete the automated worksheets, certain data is required including soil test analysis, crop rotation, expected realistic yields, number, species, and estimated weights of livestock, manure application, incorporation timing and methods.

General. Planners will be able to use this automated package if they have a basic understanding of nutrient management and waster utilization technology and have basic Excel spreadsheet skills. The state agronomist is responsible for any worksheet editing. The original package of worksheets is protected so that the worksheets are not corrupted unintentionally. For your protection, a separate copy of the package should be stored in a separate location prior to any data entries or saved in a separate location on the hard drive for recall later if needed. The Excel worksheets are color coded so that planners can follow through the data entry easier. When initially opening the package, the computer will ask if you want to *"enable macros"?* You must left-click on the *"enable macros"* to begin.

The worksheets are designed to look identical to the worksheets found in the Field Office Technical Guide, (FOTG), Section IV, Practice Standards Nutrient Management (Code 590) and Waste Utilization (Code 633).

FEATURES

The worksheets feature: 1) interactive cells that populate some information automatically when used by other worksheets; 2) pull-down HELP TABLES and prompts; 3) sequential calculation of formulas as information is entered; and, 4) color-coded data entry cells to assist the planner with tracking planning information throughout the worksheets. HELP prompts can be identified by the "red triangles" located in the upper-right corner of some cells, and are activated when the user moves the cursor over the particular cell. The information will be displayed as long as the pointer remains over the cell.

Protection:

To help maintain the integrity of the worksheets, each is protected from accidental entry except in designated cells. It is recommended that the user save a blank copy of the worksheets as a template just in case the working copy becomes corrupted. As a planner completes the worksheets, the file can be saved using file names familiar to the planner for later recall and modification.

Printing:

Worksheets can be printed as they are completed using the default office laser printer, or can be printed in color to assist with presentation to the customer.

Individual Worksheets:

This section provides an overview of each specific worksheet, basic data entry guidance, and worksheet output. Each individual worksheet can be accessed by appropriate worksheet tab at the bottom of the screen.

MT-CPA-590A, Nutrient Inventory:

This worksheet is the primary starting point in the nutrient planning process. The purpose of the form is to document producer baseline data for the nutrient plan. The MT-CPA-590A worksheet should be completed yearly or as the producer's crop nutrient objectives are updated. Planner's will complete the producer's name, cropping information, average annual precipitation, and soil test data. Based on realistic yield goals, the recommended crop nutrients are recorded using MSU Extension Bulletin EB161. Enter soil test nitrate-nitrogen, legume credits, and irrigation water nitrogen credits as applicable. Once the crop needs and inputs are recorded, the worksheet calculates initial values for supplemental nutrient requirements. Nutrient inputs in excess of crop needs are displayed as "0". It should be noted that these supplemental values will not likely be exactly the same as the final nutrient recommendation.

MT-ECS-590B, Nutrient Budget:

The Nutrient Budget worksheet is one of the producer products for the conservation plan. The planner will complete the producer and location information as text in the lines provided. A Job Class entry is provided and must be filled in. Once the producer information has been entered, the planner will need to identify on the worksheet the "Purposes" the plan is trying to address. Each objective can be marked with an "X".

TABLE 1. Field Conditions and Recommendations

Enter crop and yield information as text in the boxes provided. Current Soil Test information for phosphorus, potassium, pH, and O.M. are already entered from the MT-CPA-590A worksheet. The planner will need to enter E.C. and SAR if available from the soil test. The nitrate box does not populate automatically since this information is in PPM. Enter PPM of nitrates if available otherwise leave blank. Recommended Nutrients will automatically populate from the MT-CPA-590A worksheet.

TABLE 2. Nutrient Sources

LINE 1 — Is entered for nitrogen credits in pounds per acre from the soil test. Same as MT-CPA-590A.

LINE 2 — Is entered for nutrient credits from second or third year manure applications.

LINE 3 — Irrigation water credits, if analyzed, will be entered automatically from the MT-CPA-590A.

LINE 4 — Will generally document nitrogen credits from organic matter and is populated from the MT-CPA-590A worksheet.

LINES 5 & 6 — Nitrogen credits will be automatically added and displayed.

LINE 7 — Fertilizer can be entered as "Starter" or other "Commercial" forms. The first box to the right of "Starter" is to enter the fertilizer form, i.e. 18-46-0, as text. The next box will be used to enter the bulk amount per acre, such as 50 pounds (ALSO, SEE HELP FLAGS). The planner will then enter the amount of actual nutrient per acre for nitrogen, phosphorus, and potassium in the "Budget" boxes provided. If another Commercial Fertilizer is to be applied, then enter only the actual amounts applied per acre in the "Budget" boxes (actual N, P_2O_5, K_2O).

LINE 8 — Manure/organic materials will automatically be populated from MT-CPA-590A in the "Budget" column. An entry for the "adjusted" column is required to be made directly.

LINE 9 — Is an automatic calculation from previous information.

LINE 10 — Automatically displayed from information entered above under "Recommended Nutrients."

LINE 11 — Nutrient Status is the difference between the recommended amount and the plant available nutrients. Deficiencies are displayed as negative numbers. Excess amounts are displayed as positive numbers. No calculations on the part of the planner are required.

LINE 12 — Offset Tie-up, will calculate additional nitrogen needed due to residue. The planner will enter in the box to right of "Residue #" the total amount of residue remaining, i.e., 3,500 pounds. A HELP TABLE is provided for various crops and the residues they produce per unit. The planner will then enter a value for the "N rate/100 pounds" of residue between .75 and 1.00. A default of "1.00" is already entered. A value for additional nitrogen needed will be displayed as a negative number.

LINE 13 — Recommended Crop Nutrient Application displays the final difference between nutrients available and nutrients needed. Nutrient deficiencies are displayed in whole numbers. Nutrients available in excess of crop needs will be displayed as "0".

LINE 14 Recommended Crop and Soil Application is the amount of nutrients to meet crop needs as well as improve soil health. An additional 20-30 pounds of nitrogen is suggested beyond crop needs for soil health (SEE HELP NOTE). The value entered for nitrogen needs to be determined based on nutrient deficiencies or excesses. The only entry required by the planner is for nitrogen. Phosphorus and potassium values will not change.

MT-633-JS3, Estimating Manure Nitrogen:

This worksheet is prepared when nitrogen from actual manure tests is not available.

LINE 1 Place an "X" in the appropriate box indicating whether the system is a beef open feedlot. If "YES" is indicated, a prompt will guide you to the "Estimating Beef Feedlot Manure Production. If "NO" is indicated, enter values for number of animals, days, and pounds of nitrogen excreted/day. A HELP TABLE is available for pounds of nitrogen. Enter a "X" in the box indicating manure is separated or not. If "YES," then place an "X" in the applicable Manure Form. If "NO," then go to Line 2. If manure is separated, a value for the pounds of nitrogen as liquids and solids will be automatically computed.

LINE 2 Enter the Nitrogen Retention Value retained from the pull down HELP TABLE. Document, as text the type of manure management system that was used for the value.

LINE 3 Enter the Nitrogen Conversion Data from HELP TABLES for the 1st, 2nd, and 3rd years.

LINE 4 Enter the Denitrification Value from the HELP TABLE. Only the 1st year entry is required.

LINE 5 Enter the Application Method from the HELP TABLE as text. Enter the Time Value from the HELP TABLE only if the manure is to be incorporated.

LINE 6 Values are automatically calculated.

LINE 7 Based on form, enter the value in cubic feet per day from the HELP TABLE.
NOTE: No values are recorded or entered when feedlot worksheet is used.

LINE 8 Values are automatically calculated for the 1st, 2nd, and 3rd years.

MT-633-JS7, Manure Test Nitrogen:

This worksheet is prepared based on manure test analysis. The planner may see information in units expressed as pounds/ton, pounds/1,000 gallons, or percent. If units are in percent, the quantity of manure as excreted must be computed, multiplied by the percent of nutrients, then converted to pounds/ton or pounds/1,000 gallons prior to entering information on Line 1.

LINE 1 Mark appropriate box with "X" for manure form and enter nitrogen value from manure analysis

LINE 2 Enter the Nitrogen Conversion data from HELP TABLES for the 1st, 2nd, and 3rd years

LINE 3 Enter the Denitrification value from the HELP TABLE. Only the 1st year entry is required.

LINE 4 Enter the Application Method from the HELP TABLE as text. Enter the Time Value from the HELP TABLE only if the manure is to be incorporated.

LINE 5 Values are automatically calculated.

LINE 6 Based on form, enter the value in cubic feet per day from the HELP TABLE.

MT-633-JS1, PAGE 1, Manure Nitrogen Crediting:

This worksheet will bring together information from either the MT-633-JS3 or MT-633-JS7 to develop the amount of applied nutrients from the manure source. The producer's name, animal species, and manure form are entered as text on the lines provided (NOTE: Even though additional lines of entry are available for other animal species and manure forms, it is likely that no more than one set of information will be used. The worksheet is not designed to handle more than one manure form and species.

Total Available Nitrogen in Manure:

Enter an "X" on the line for the manure analysis source. Hit "Enter" or move off the cell. Information from the document selected will automatically populate entries for the 1st, 2nd, and 3rd years.

Application Rate:

Enter on the lines provided for year 1, 2, and 3, the application rate alternative. Refer to the HELP GUIDE for assistance in determining rates.

Nutrients Applied:

This section of the worksheet will automatically be calculated based on data from the previous sections. The planner must enter the years when the nutrients will be available to the crop, i.e. 2001, etc.

MT-633-JS1, page 2, Phosphorus and Potassium:

Phosphorus and potassium credits can be determined through available information from the manure analysis (TOP HALF OF PAGE 2), or continuing with the estimation method (BOTTOM HALF OF PAGE 2).

Manure Analysis Available:

Enter phosphorus and potassium values from manure analysis. (If manure analysis information is in percent, the quantity of manure as excreted must be computed, multiplied by the percent of nutrients then converted to pounds/ton or pounds/1,000 gallons prior to entering information.

Enter on the line provided, the manure form, either "Solid" or "Liquid".

Enter the application rate for phosphorus and potassium in the blocks provided. Entries should be the same as the nitrogen application entry on page 1 of the worksheet.

Manure Analysis Not Available:

Enter an "X" in the appropriate box if the manure has been separated. If the manure is separated, then enter an "X" in the box for the selected applied form. From the HELP TABLE for phosphorus per day and potassium per day, enter a value for the kind of livestock being planned for.

Use the HELP TABLE to enter the cubic feet per day excreted by the selected animal species.

Enter the application rate for phosphorus and potassium in the blocks provided. Entries should be the same as the nitrogen application entry on page 1 of the worksheet.

NOTE: Calculated values for nitrogen, phosphorus and potassium will automatically be entered on the MT-CPA-590A Nutrient Checklist.

MT-ECS-590C, Field Specific Nutrient Application Plan:

This worksheet documents as a producer product the application of nutrients for specific fields. The planner will need to initially enter producer, crop, and location information on the worksheet as text. Job Class is also entered and may be based on Job Class criteria for either the FOTG, Section IV, Practice Standards Nutrient Management (Code 590) or Waste Utilization (Code 633), whichever is most restrictive.

Manure:

The planner will enter the year, field, crop and spreadable acre information for the plan. For "Season," enter when the manure will be applied (SEE EXAMPLES). Enter Incorporation Timing as per the example. "Recommended Rate" is entered on the worksheet based on the selected rate from the MT-633-JS1 worksheet. Available nutrients are entered for nitrogen, phosphorus, and potassium from the MT-633-JS1 or MT-CPA-590A worksheets.

Fertilizer:

The planner will enter the year, field, crop and acres for the plan. Remember that if only a portion of a field will have spreadable acres for manure, then the remaining acres would need to be accounted for under the "Fertilizer" portion of the worksheet. Entries for "Recommended Timing & Amounts" need to be numerical. EXAMPLE, Pre-Plant: 82-0-0 for anhydrous and Amount: 41-0-0 for a 50 pound rate. The same format would be true for "Starter" and "Sidedress." The "Available Nutrients at Selected Rate" would be a summation of all of the applied amounts for nitrogen, phosphorus, and potassium.

*Excel spreadsheet designed by Dale Krause, Resource Conservationist.